

Why & How?

Summer 2018

Issue 3

The Primary Science Teaching Trust Newsletter

Supporting excellent teaching and learning in primary science

Free to
access for
all



Inside this issue:

Common Misconceptions

Dealing with the complexities of teaching and learning about evolution

Planetary 'Hide and Seek'

Free Titanic Science sample!

Pictures for talk in science

CONTENTS

Click to
jump to
article

➔ News 4

➔ Common misconceptions 7

PSTT College Fellow Beth Budden discusses how to deal with the complexities of teaching and learning about Evolution.

➔ Resources

Selection of free, ready-to-go, downloadable resources.

Pictures for talk in science 10

The Why & How Challenge 12

Titanic Science 14

➔ I bet you didn't know... 16

Prof. Dudley Shallcross links cutting edge research with the principles of primary science.

➔ In conversation with... 18

College Fellow and Cluster Advisor Peter Sainsbury discusses microscopes, exploration and having 'PHUNN' in the classroom.

➔ College Snapshot 20

Meet six of our College Fellows who share some quick thoughts and suggestions for teaching primary science

➔ Research Update 22

➔ Project Update 23

➔ Key Dates 26

The Primary Science Teaching Trust (PSTT) is not liable for the actions or activities of any reader or anyone else who uses the information or the classroom materials in this publication. PSTT assumes no liability with regard to injuries or damage to property that may occur as a result of using the information or materials contained in this publication

PSTT recommends that a full risk assessment is carried out before undertaking in the classroom any of the practical investigations and activities contained in this publication.

**Why & How? is the brand name of the
Primary Science Teaching Trust**

Tel 0117 325 0499 • **Email** info@pstt.org.uk •

Web www.pstt.org.uk

Primary Science Teaching Trust •

12 Whiteladies Road • Clifton • Bristol • BS8 1PD

Connect with us



Welcome

A warm welcome to our Summer 2018 issue of **Why and How? - the Primary Science Teaching Trust's termly newsletter.**

Why and How? is for anyone who has an interest in primary science. Our newsletter offers practical support, news and updates about PSTT and our projects and research.

A highlight at PSTT this term has been the launch of our new Wow Science website, and we are delighted with how well this has been received. We share more details of this exciting development in our **news** and **project** sections. The **news** page also celebrates the achievements of some of the PSTT Fellows and collaborators. In particular we congratulate and celebrate four of our Fellows for the excellent contribution they made to the BBC's Terrific Scientific webinar.

The summer term is often the time teachers choose to tackle evolution, or with younger children, to build foundations for this by learning about living things. Our how to deal with children's **common misconceptions** section focuses on evolution. It is written by PSTT College Fellow Beth Budden who provides exceptionally clear explanations and highlights the important role of observation in developing understanding.

Our ready to go and **free resources** in this issue include a sample lesson from our hugely popular book, 'Titanic Science'. Created by PSTT College Fellow Jim McDaid, these resources take the story of the designing, building, sailing and sinking of the Titanic as a context for science investigation. Based on the lives and particular Titanic experiences of six fictional characters, the investigations explore the science behind what happened to the world's most famous ship.

DOWNLOAD ALL ISSUES FOR FREE AT:

www.pstt.org.uk/what-we-do/why-how-newsletter

Advances in AI and robotics are increasingly reported in mainstream news (with the driverless car being a recent high profile example) and robots provide a great subject for talk in science. This issue's **picture as a stimulus for talk** can be used to promote ethical and philosophical discussions as well as talk that addresses concepts about characteristics of living things, forces and electricity.

*A highlight
for PSTT this
term has been
the launch of our
new Wow Science
website.*

Our summer **Why and How Challenge** will get the whole school learning science outside. It stimulates the children to look at their natural environment with more purpose and accuracy as they try to identify where in the school grounds they can find the greatest number of living things. You could add extra excitement to this by running it as a whole school competition. Please do share this (and all our free resources) with your colleagues.

This issue's '**I bet you didn't know**' is called 'Planetary Hide and Seek'. In this article, PSTT's CEO Dudley Shallcross describes evidence that suggests the existence of a huge planet in our solar system beyond Pluto. His accessible summary of this real science research will be a source of fascination to teachers and also to the children. It provides an excellent stimulus for discussion about how scientists work. For example, how can they find out about things they cannot see? And how could we simulate this in the classroom?

Our '**In conversation with.....**' feature asks a College Fellow to share some of their thoughts about primary science and to explain what drives them. In this issue we meet PSTT Cluster Advisor and College Fellow, Peter Sainsbury who discusses microscopes, exploration and having 'PHUNN' in the classroom.

This issue of Why and How? includes our **College Snapshot**, a new section in which six of our College

Fellows share some quick thoughts and suggestions for teaching primary science.

Please do take some time to read our **project updates** section which this term is full of useful links to reading and resources. As well as bringing you details of Wow Science, we have included a piece to support family learning in science, and a link to the new TAPS special issue of the ASE's journal, Primary Science.

In our **research update** we hear from PSTT College Fellow Clarysly Deller. She outlines findings from her MA research project which looked at the role of Science Ambassadors in primary schools.

Last but not least – our **key dates** page provides reminders of what is on the horizon for primary science. Once again, we would specially like to draw your attention to our Primary Science Education Conference (PSEC) due to take place in Edinburgh in June 2019. Would you or anyone in your network, like to contribute to the programme? Our call for programme proposals is now open and will close on 14th September 2018, find out more by [clicking here](#). We also have a generous bursary scheme to support teachers to attend the conference. Applications are now open, find out more [here](#).

We invite you to share this newsletter with anyone you know who has an interest in primary science, and please do get in touch with us about what you like about our newsletter and what you would like to see in it. Please send your feedback and suggestions to us at newsletter@pstt.org.uk



Prof. Dudley Shallcross
CEO



Ali Eley
Academic Director



Dr. Sophie Franklin
Cluster Director



Sue Martin
Programme Director





News



➔ PSTT Fellows form expert panel for the BBC's Terrific Scientific Question: Investigation Webinar

This summer, the BBC Terrific Scientific campaign's final investigation asks primary children across the UK to come up with their own science questions and to design an investigation to explore them. All schools that participate in this final investigation are encouraged to join the Great Science Share for Schools to share their chosen investigations with others.

To help teachers to prepare for running this investigation, four PSTT College Fellows took part in a live webinar for Terrific Scientific. Jeannette Morgan, Jo Moore, Tom Holloway and Jules Pottle shared expert advice and ideas with teachers to help them ensure their children's questions would generate good investigations. Skilfully chaired by the Wellcome Trust's Education Programme Manager Louise Stubberfield, the panel responded to a diverse and interesting collection of children's questions sent in by their teachers. Within 24 hours of going live, the webinar was viewed over 1,500 times – have a look at it [here](#).

PSTT have also supported Terrific Scientific with some written resources. College Fellow Rufus Cooper has written a guide for teachers, '[What is child-led enquiry](#)' that is available on the BBC Terrific Scientific website. Further support is given at the end of the guide where 'Frameworks and practical ideas to support child-led enquiry' written by Ali Eley and Rufus Cooper can be downloaded.

"Taking part in the BBC Terrific Scientific webinar was a fantastic experience. The questions were brilliant and it was great to be able to talk science with such a large audience."

- Tom Holloway





→ Are you looking for excellent resources to help you plan engaging science lessons?

Do your children love science?

The PSTT's Wow Science website seeks out the best resources on the internet and in apps for tablets/smartphones, for children, parents and for everyone teaching primary science.

wowscience.co.uk

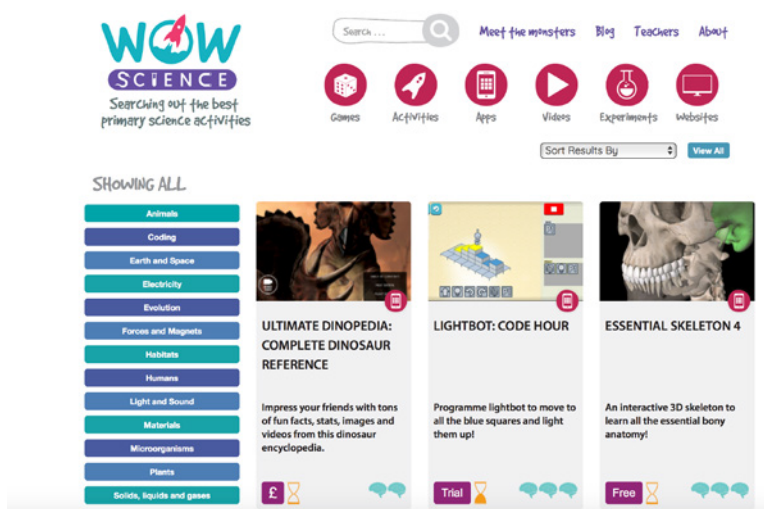
Keep up-to-date with current news and even more classroom ideas on social media:



www.facebook.com/wowscience



[@QWowScienceHQ](https://twitter.com/QWowScienceHQ)



→ The Great Science Share for Schools initiative wins 'Making a Difference' Award

Very many congratulations to Dr Lynne Bianchi and the team at the Science and Engineering Education Research and Innovation Hub (SEERIH) at the University of Manchester. SEERIH is once again the winner of one of the University's 'Making a Difference' awards for its initiative, The Great Science Share for Schools.

The Great Science Share is a national campaign that involves school children sharing their science learning with new audiences. Through collaborations between STEM organisations and businesses, universities and schools it aims to inspire those from 5 years old to be a scientist and engineer. This year's, on 19th June, has over 20 satellite events happening across the UK - more than 22 thousand children will be involved!

The University of Manchester is one of the PSTT's academic collaborators and all at PSTT are delighted that SEERIH has been recognised with this award.

→ Assessment News

[Click here](#) for the open access TAPS special issue of Primary Science, edited by Sarah Earle (Project lead for TAPS, Bath Spa University). This collection of articles offer a range of assessment support for all teachers. Please see the project update on [page 24](#) for more details.



➡ 'Take a Closer Look' - Science and Photography



Children are 'wowed' by an exhibition of outstanding images from the world of microscopy

PSTT Cluster Advisor, Peter Sainsbury, reports on an event arising from collaboration developed within the PSTT supported Salisbury Cluster Project.

A joint project between David and Madeleine Spears, the Royal Microscopical Society (RMS), the Primary Science Teaching Trust (PSTT), and local primary schools illustrated and celebrated what schools can achieve when they collaborate with each other and with outside agencies. The initiative, which took place over 12 days in the Edwin Young Gallery, Salisbury City Library, proved so popular that it was extended for a further 10 days to enable more members of the public to visit and enjoy the exhibition.

The exhibition was organised as a collaborative project to bring significant science and amazing photography together to generate exciting and inspiring experiences. Local primary schools were invited to workshops held over the two days that had been set aside specifically for schools.

The workshops, supported by the RMS Microscope Activity Kit (MAK) resources, with microscopes provided by Spears Imaging, included meeting leading scientists and photographers David and Madeleine Spears, who helped the children discover the world of the microscopic, including the finer details of our digestive system. Peter Sainsbury, from Winterbourne Earls Primary School and Cluster Advisor at the PSTT, helped children explore the 3 'Ls of microscopy: Light, Lenses and Looking. Children were given time to use microscopes, draw and enjoy images of minibeasts.



Some of the images, which included pictures of fleas and lice, were up to 2.5m tall.

Primary schools from the Salisbury area work together in clusters; over the last few years, 5 of these have formed specific science clusters, supported by the PSTT. The 35 schools involved aim to improve science teaching and opportunities by linking with industry, national organisations and Learned Societies, initiating projects and developing and sharing good practice.





Common Misconceptions

Evolution



Beth Budden, PSTT
College Fellow, shares
some of her experiences
of teaching **evolution**.



bbudden.209@lgflmail.org

What children need to know:

- *There are similarities and differences between living things and they can be grouped according to specific characteristics*
- *Animals and plants live in habitats to which they are suited*
- *Living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents*
- *Living things have changed over time and fossils provide information about living things that inhabited the Earth millions of years ago*
- *Animals and plants are adapted to suit their environment in different ways and adaptation may lead to evolution*

Common misconceptions – often children may think that:

- *Environmental change can be inherited, e.g. if a sheep loses its tail, its lambs will be born without a tail*
- *Humans used to be monkeys*
- *An individual can evolve during its own lifespan*
- *Evolution produces living things perfectly adapted to their environment*
- *Natural selection is an active process, ie an individual or a species can try to adapt*
- *Natural selection is always good for the species*
- *Evolution and religion are incompatible*

Last year I attended an excellent lecture at the Institute of Education by Professor Martie Sanders on teaching evolution to young children, which provided me with ideas to share.

As evolution now has to be taught in Key Stage 2, I think it's really important for teachers to think carefully about how to do this, and do it well. In this article, I bring together resources that teachers may find helpful when tackling this topic.

To begin with I'm going to use a quote Martie used:

"Nothing in biology makes sense except in the light of evolution."

(Dobzhansky, 1973:125)

You could also watch a quick [YouTube clip](#) about why evolution is important explaining this in a snappy set of clips, but in essence, life processes and living things begin and end with evolution. If children understand the basic concept of evolution it will mean they have a fundamental foundation for understanding all other biological concepts. Even if children don't become scientists, understanding evolution brings the individual a clearer sense of the relationship between living things and the environment and this helps them become an informed citizen. For example, take the over-use of antibiotics causing bacteria to become resistant to common drugs, then developing into 'super bugs'. This is evolution!



WORRIES ABOUT TEACHING EVOLUTION

Martie shared her studies carried out in South Africa and found that when confronted with teaching evolution, teachers were most worried about their own subject knowledge and also about conflicts with their own or children's religious ideas. However, her quote 'knowledge is power' really made sense here. The best thing to do then is not to shy away from teaching it but jump right in and try to understand what's going on.

It is important to make a distinction between *scientific explanations* and *religious beliefs* and not to set them against each other, even if they seem contradictory. For me, it's a mistake to present both religious and scientific ideas as theories because we are then using 'theory' in a very causal way and not a scientific way. A theory comes about when a hypothesis has been tested using evidence. A theory is not a belief; a theory is a viewpoint arrived at using all the evidence presented so far; theories themselves can also evolve and change depending on the evidential base. So – I would say, please don't call beliefs theories; you need evidence to have a theory.

So, once you're comfortable with presenting these scientific explanations, and have not set these against any 'beliefs' in the room, then it's all about getting to grips with the subject knowledge and how best to teach it.

SUBJECT KNOWLEDGE

Let's start with **variation in a population** (a group of the same species living in a particular area). A farmer wants to breed sheep with thick curly brown fleeces. They have a herd of sheep with different kinds of fleeces: grey, brown, black etc. What do they do? They select two sheep with the thickest, curliest, brown fleeces and breeds them. This is selective breeding. The two curly, brown sheep have a few lambs. Of these the farmer only allows the ones with the curliest brown coats to breed. The farmer continues like this so that over the generations, more and more offspring have the thick, curly brown feature and any other colour or texture is bred out.

Now, what Darwin thought was, 'maybe this happens in nature too?' Maybe somehow, there is a process of natural selection so that certain attributes become more prevalent? He was right, but here comes a problem and a potential misconception for children!

ANTHROPOMORPHISM AND EVOLUTION ON DEMAND

The trouble is that the way we talk about living things



often sends the wrong message and forms the basis of misconceptions for young children. When we say things like 'some plants **prefer** more light' or 'roots **try to find** water' we are implying that these living things possess decision making abilities. They don't. So as teachers we need to be really careful how we say things. Most of biology is process driven and not decision driven, and we need to use language to indicate this.

The point here is that living things do not **choose to evolve** - that's why Darwin used the word 'natural selection'. A polar bear did not at one time choose to grow thicker hair in order to live way up North, just as a tiger did not choose to grow a stripy coat so it could hide in the leafy jungle and hunt. Instead, these were naturally selected attributes that became more prevalent over generations. In fact, let's use Martie Sanders' definitions to make the three key areas clear:

- **Evolution:** "Changes in a population, resulting from the increase of certain features in the population over many generations."
- **Natural selection:** "The mechanism by which evolution occurs."
- **Adaptations:** "Evolutionary results of natural selection in a population."

Let's take the tiger and its stripes. We take a population of big cats with plain coloured fur. A genetic variation means that some of the cats are born with a stripe or two. It turns out that when they are hunting the stripes give them a slight advantage over the plain coloured cats. They are better camouflaged and as a result they are better at catching food and so have a better diet. This gives them more energy to breed and to reproduce. Their offspring are born with the same kind of stripes because they share the same genes. These tigers also have an advantage over the less stripy cats, and they hunt more and reproduce more.



So now there are more stripy cats and fewer non-stripy cats. The stronger stripy cats are more likely to mate with another stripy cat. Eventually, this goes on over many generations and each generation includes more stripy cats because the adaptation of 'stripy fur' has been naturally selected. Remember, the tiger didn't decide to get more stripes, or decide to choose a stripy mate even, but they might reproduce with the fittest mate, who was stronger because he had stripes and was more successful at hunting – see 'survival of the fittest'. Even this term can be misinterpreted, like living things having some big kind of fight and the strongest one winning – as you can see, it's not quite like that. It simply means that the living being with attributes best suited the environment is more likely to survive and reproduce than one that doesn't. Remember, no decision making – just process.

Children rightly love stories with animals, but this can sometimes create or reinforce misconceptions about them and about evolution. Please don't stop reading wonderful stories to children but do choose carefully which ones you use to support and enrich your science lessons!

EVOLUTION IS LEARNT MOSTLY THROUGH OBSERVATION

Just as Darwin arrived at his theory of evolution through observing living things and recording evidence, children's understanding of evolution can be developed in the same way. They need to be provided with lots of opportunities to 'play at evolution' themselves. Martie Sanders suggested using the attributes of insects to investigate camouflage and survival. For example, on a leafy green plant, which beetle is more likely to be spotted by a predator? And what are the consequences for this beetle?

There are lots of games children can play like this. You could darken the room, like a deep jungle, cut the beetles out, lie them on a green leafy background and give the children ten seconds to pick up as many as they can (playing the role of predator). Because they will naturally find it easier to pick out the black and



then yellow beetles against the green, they will see how more of the green beetles will be left to survive and reproduce with other green beetles. What I find fascinating here is that this shows the localised nature of evolution. Children often think all polar bears came at once or all tigers, or green beetles suddenly appeared. The point is that if evolution begins with variation in a population, this is referring to groups of living things living nearby each other. In this way, the adaptations are local to the population, which of course might be so well adapted to where they are that they get bigger and bigger leading to migration and larger, more global populations. All this is at the heart of the great 'tree of life' and the huge variety of life on earth. Amazing!!!

Here's another great activity which uses different utensils to model bird beaks and how they pick up different types of food:

Bird beak activity and speciation

The Open University has an excellent interactive 'Tree of Life' poster which you may find interesting and helpful:

Tree of Life



Free resources

Pictures for talk in primary science

A picture can be a very good stimulus for children to engage in effective talk in science.

Using pictures is an inclusive approach that facilitates high levels of participation. Pictures can also be used as a starting point for inquiry. The discussions the children have will generate questions that they want to investigate.



Asking the children carefully chosen questions about the picture will support them with learning to:

- *construct explanations and link their ideas with evidence*
- *make confident challenges to the ideas of others*
- *explore scientific terminology and use it with genuine understanding*

Pictures for talk in science activities are designed to be very open ended and usable with any age of children. The activities can be done as a quick ten minute starter, or extended into a longer and more in-depth lesson.

WHAT TO DO

Download the image overleaf by following the link, and either display on a whiteboard or give children printed copies. Ask the children to work in groups of three to discuss the following questions:

DO YOU THINK ROBOTS ARE BETTER AT
MAKING POPCORN THAN HUMANS?
WHY DO YOU THINK THIS?

Other questions to generate and promote thinking and explaining

Is this robot alive? How do we know if something is alive?

Does this robot have senses? Which ones?

What can it do that a human can do?

*What **can't** it do that a human can do?*

*What can it do that a human **can't** do?*

The above could lead to some philosophical discussion. You could ask:

Are robots a good thing? Or a bad thing? Or neither?
Why do you think this?

What things are there that humans can do that robots will never be able to do? How do you know this?

Some background information about a household robot like this one:

It is deemed to have the intelligence of a four year old child.

It has numerous sensors to enable it to define and respond to its environment.

It reacts to ambient light, sound and movement.

It is designed to enable people to be more productive at home.

A PICTURE OF A ROBOT MAKING A PANCAKE CAN BE VIEWED BY CLICKING HERE



© Michael Memminger

[CLICK TO DOWNLOAD IMAGE](#)



Free resources

The Why and How Challenge

The 'Why and How' Challenge is intended to be something for the staffroom table that lots of teachers will try.

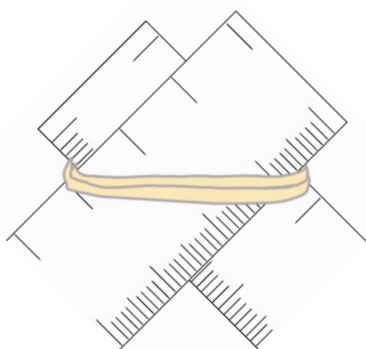
This issue's Why and How Challenge is an **OUTDOOR ACTIVITY** that will encourage the children to look at their natural environment with more purpose and accuracy. It can be run with small groups, a class or as a **whole school competition?**

Who can find the greatest number of living things?

WHAT TO DO

Each child or group of children needs to make a frame out of four 30cm rulers (Figure 1). The corners should be held together with elastic bands.

Figure 1



Give the children the challenge **"Who can find the greatest number of living things?"**

Tell the children that to:

- choose an piece of ground and put down their frame (Figure 2)
- identify how many different living things they can find inside the frame
- record what they have found
- choose another piece of ground and repeat the above

Figure 2



RESOURCES

30cm rulers – 4 per group of children

elastic bands – 4 per group of children

Hand lenses

Optional extra resources:

Collecting pots

Plastic teaspoons

Pooters

Metre rulers (or other longer sticks) for making larger frames

NB a frame like this with sides of 1m is used by scientists to mark out random areas to be surveyed. Its scientific name is a **quadrat**.



POINTS TO NOTE:

- The children should be encouraged to observe inside the whole frame and to use hand lenses
- Most of what the children find will be plants and they may need reminding that plants are living things
- Some plants will be hard to spot amongst other plants - what looks like only grass is likely to be more than that
- Children should look for how many **different** living things they can find – they can only count each type once
- The children could take photographs of their frames in different places and annotate these with what they found when they are back in the classroom
- There is lots to discuss with the children while they are doing the activity and afterwards: what plants and animals need to survive; the environment inside their frame (damp/dry, sunny/shady, windy/sheltered); the types of plant there (tall/short, dense/sparse); the types of animal there (small/large, insects/molluscs/others, how they move, what they eat); why they think particular plants or animals were found there.

VARIATIONS

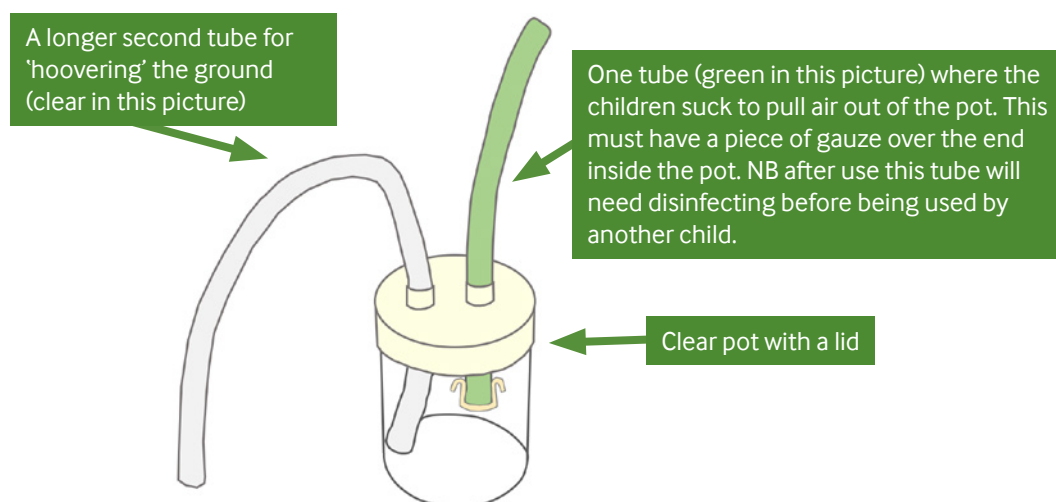
- Use metre rulers to make the frames. You could also use hoops or string loops. Note that using string loops will make it tricky to ensure that the same survey area inside the loop is created each time. This could however generate some interesting maths discussions about the relationship between perimeters and areas of shapes.
- Ask the children to look at and count only plants, or only animals – discuss with them how will this affect where they choose to look
- Collect animals using a pooter (Figure 3)

RULES FOR THE WHOLE SCHOOL COMPETITION

Each class carries out the challenge and then submits a photo of their frame in the place where their class found the most living things - one entry per class.

Each photo should have a list of all the living things they found in the frame.

The photos are compiled as a slide show for the whole school to watch ... and the winning class is revealed.



Pooters are commercially available but it is possible to make your own

Figure 3



Titanic Science

EXCLUSIVE FREE SAMPLE for Why & How readers

Free resources

From PSTT's own collection

This sample lesson is one of fifteen investigations based on the fictional stories of people involved in the design, construction, sailing and sinking of the Titanic. The children meet the characters at the start of the book. The lives and experiences of these fictional people then create a motivating and meaningful context for the children's investigations.



CHRISTABEL ASKS:

"The iceberg has done so much damage! I wonder how much of it is underwater?"

What do we know about icebergs? It's hard to imagine how something made of ice could have such a devastating effect; observations over time. In this activity children will make their own icebergs and as a group, work out how to measure the volume of it by displacement and consider the effect of temperature on the rate of melting.

LEARNING INTENTIONS

- To observe, record and analyse accurately.
- To take on roles and responsibilities when working in a group.

SCIENCE CONTEXT



Almost 90% of an iceberg is hidden underwater. This is why they are so dangerous to ships as they can only see the 'tip of the iceberg'. In this investigation, children will measure the volume of the iceberg before moving on to explore how it changes as it melts.

Air temperature and water temperature vary from season to season and with latitude. A location at 60°N (Alaska) is much colder than one at 17°N (Hawaii). The lower the latitude, the higher the water temperature. They can then relate this to the latitude that Titanic was travelling at; if Titanic was travelling further south would she have met any icebergs?

RESOURCES



- Balloons
- Food colouring
- Scissors
- String
- Ruler
- Thermometers
- Transparent containers for water baths
- Stopwatches
- Freezer
- Measuring cylinder

KEY QUESTIONS



- What do you notice about how much of the iceberg is above water?
- How does the shape of the iceberg change? How does it move?
- What do you notice about the food colouring?
- Why is the iceberg melting? What can you hear?

WHAT TO DO



MAKING ICE BALLOONS

- Add a few drops of food colouring to a balloon then fill with water. Attach the balloon to the tap, turn on the water until the balloon is full then knot the end.
- Freeze the balloon for at least 24 hours. Once frozen, cut the end of it and carefully peel the balloon away from the ice.

DISPLACEMENT ACTIVITY

- Place a container large enough to take the ice balloon inside another container. It is best if these containers are transparent.
- Fill the inner container with water so that the water is level with the rim of the container.
- Place the 'iceberg' carefully into the inner container, it will push out (displace) its own volume of water. This water will be collected in the outer container.
- Carefully pour the water collected in the outer container into a measuring cylinder- you can now measure the volume of the iceberg - relate to Archimedes' Bath story.
- **You can continue this investigation by observing and measuring the rate of melting.**

OBSERVATIONS OVER TIME

- Place four different temperature water baths around the classroom, it is up to you how to set them up, we recommend using iced water, cold tap water, tepid and hot water – no hotter than 60 degrees centigrade. Each group will be carrying out the same tasks.
- Decide who will be doing what in each group, assign roles. There are a few tasks:
 - a) Measuring the temperature of the water bath to see how this changes over time.
 - b) Measuring the circumference of the 'iceberg' to see how this changes over time.
- As a group, pupils must work out the best way to measure the circumference of the balloon. Some pupils will need guidance with this, others can be left to work it out. We found the best way is to wrap a piece of string around the 'iceberg' and cut the length. This way the pupils can lay the string lengths out in front of them to see how the circumference changes over time.
- Pupils decide how often they want to take measurements.
- You can add some food colouring (different to the balloon) into the water. This will aid in observing the melting of the iceberg. Pupils should be observing the iceberg at all times (see key questions).
- This is a great opportunity to collect a whole class set of data, from all four temperature stations which can then be analysed and manipulated in other lessons.
- You could organise the groups so that each one has a water bath of a different starting temperature. At the end of the investigation, the results can be compared.
- This would provide a rich collection of data which could then be used as a part of a mathematical investigation.

TAKE CARE! ALERT CHILDREN TO THE DANGERS OF SKIN BEING IN CONTACT WITH ICE FOR EXTENDED PERIODS OF TIME. DO NOT ALLOW CHILDREN NEAR KETTLES AND SUPERVISE AROUND HOT WATER.

TITANIC TRIVIA!

From the time the lookouts sounded the alert, the officers on the bridge had only 37 seconds to react before Titanic hit the iceberg. In that time, First Officer Murdoch ordered "hard a-starboard" (which turned the ship to port -- left). He also ordered the engine room to put the engines in reverse. Titanic did bank left, but it wasn't quite enough.

Click here to find out more about our Titanic Science book



Titanic Science available at
amazon



I bet you didn't know...

Planetary Hide and Seek



Prof. Dudley Shallcross, PSTT CEO, links cutting edge research with the principles of primary science

✉ dudley.shallcross@pstt.org.uk

Since Pluto was redefined as a dwarf planet there have been eight planets in our solar system, but scientists think that there is a ninth planet further away than Pluto. A recent study by two scientists from the USA, Kathryn Volk and Renu Malhotra, suggests that a ninth planet is hidden in the Kuiper Belt. This research can be used as an interesting discussion point for children.

What do our primary school children know about the solar system? Can they name the planets? Do they know the order that the planets are aligned, in terms of distance from the Sun?

The Kuiper Belt (Figure 1) lies beyond Pluto and extends to about 100 AU (AU is an Astronomical Unit, where 1 AU is the distance between the Earth and the Sun). It is a ring of icy objects such as comets, mostly composed of methane, ammonia and water.

Why might AU be a good unit to use for astronomical studies?

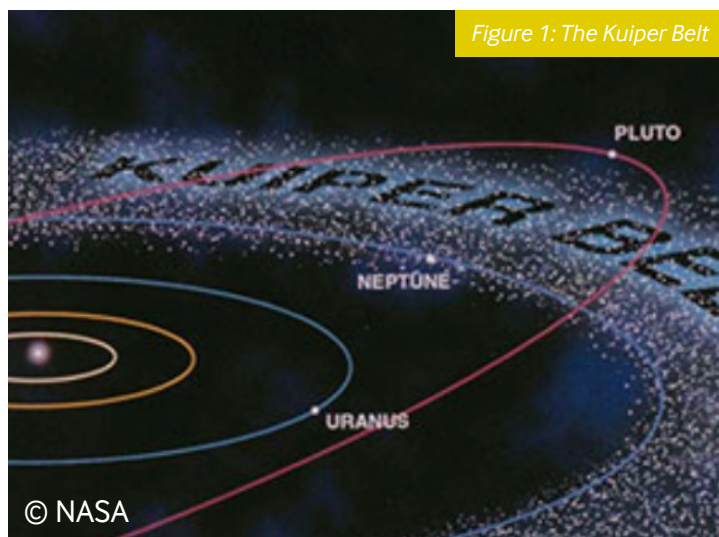


Figure 1: The Kuiper Belt

© NASA

Why is the planet hidden? Well, it is believed to be in a region of the Kuiper Belt that is hard to see with current telescopes and is also obscured by distant stars.

Why might this be a problem? How hard is it to see something with our own Sun in the background, and why is this?

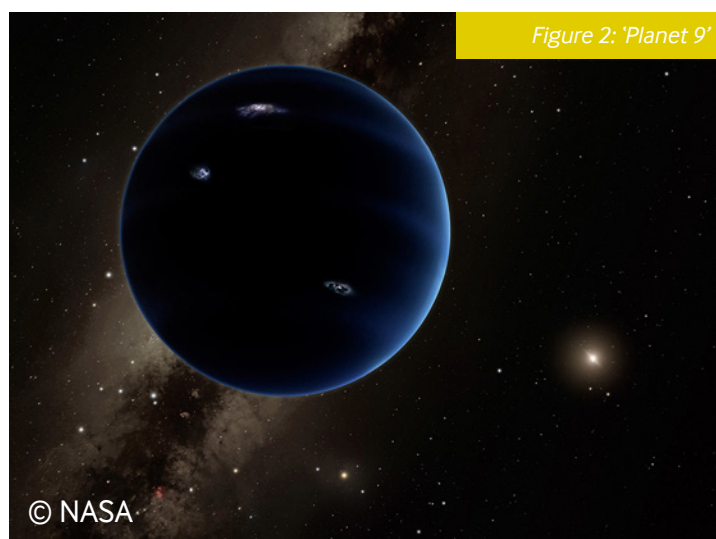


Figure 2: 'Planet 9'

© NASA

So why do these scientists think 'planet 9' (Figure 2) is in the Kuiper Belt? They have studied the orbits of a number of so-called Kuiper Belt objects (KBOs), rocks of varying size, using telescopes and noticed that these orbits were different from other KBOs, in fact the inclination (tilt) of their orbits relative to something called the invariable plane is the odd feature. Put simply, these KBOs do not orbit in a similar way to other KBOs in the Kuiper Belt and the scientists wondered why.

What is a telescope and how does it work?



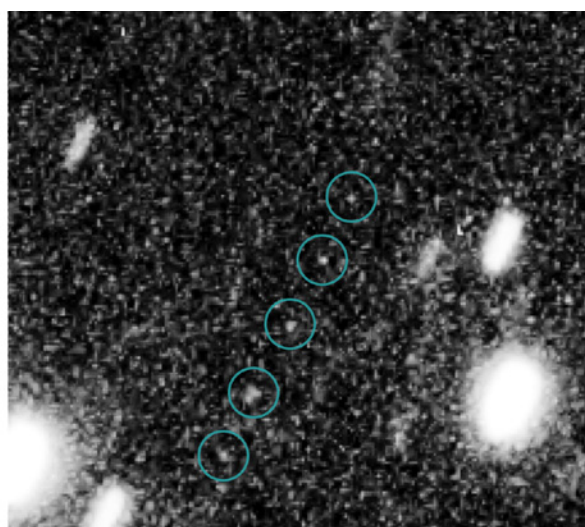
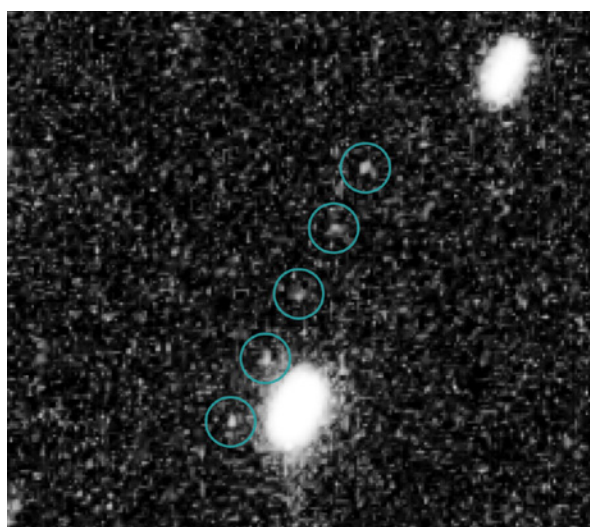
They have tried a range of explanations. It could be just a fluke that these particular KBOs orbit in this way, but their calculations suggest that the likelihood of that is just 1%. Maybe an object passed near this region some time ago? They considered this and calculated that the passing gravitational tug would have stopped by now. What would explain the altered orbits is if a planet roughly the size of Mars was present at about 60 AU from the Sun; such an object would perturb the orbits of these KBOs and be consistent with the observations.

How might we locate an object that we could not see? It would be interesting to ask our primary class how we might do that. Perhaps we could hear the object and detect the sounds that it gives off? Maybe we could smell the object? It may release certain odours that we can detect. Maybe the object vibrates, and we can feel these vibrations as we get closer? Like the hidden planet, the object may change the motions of objects nearby e.g. the flow of water or air nearby may be changed. Maybe the object is magnetic and so magnetic objects would be attracted to it? It may be a fun exercise to conceal some objects and ask the children to use their senses other than sight to

find them. We may also want to discuss with children why one object has a gravitational pull on another. On Earth if we jump up, we come back down to Earth quickly. Would we observe the same rate of return to the surface if we were on the Moon (which is a lot lighter than the Earth)? Or what about jumping on a planet like Jupiter (which is a lot heavier than Earth)?

Will we ever be able to verify this hypothesis? Hopefully the answer is 'yes' and quite soon. A new telescope called the Large Synoptic Survey Telescope (LSST) will come on line circa 2020, and it will be able to survey 20 times the KBOs currently observed. Even though some KBOs will be too far away, or too dim even for the LSST to observe, it should be able to observe planet 9 if it exists. There is also the possibility that there is more than one planet; the scientists cannot rule this out.

You can follow the development and discoveries of the LSST at www.lsst.org and continue to engage your pupils in the latest scientific research.



These two multiple-exposure images from NASA's Hubble Space Telescope show Kuiper Belt objects, or KBOs, against a background of stars in the constellation Sagittarius. The two KBOs are roughly 4 billion miles from Earth. Image Credits: NASA, ESA, SwRI, JHU/APL, New Horizons KBO Search Team

**Did you realise that both scientists are female?
Professor Malhotra has an asteroid named after her and
has had a very distinguished career as an astronomer.**

References

The research paper that generated this work was: The curiously warped mean plane of the Kuiper Belt

By Kathryn Volk¹ and Renu Malhotra¹, The Astronomical Journal, **vol. 154**, 16 pp. (2017)

¹. Lunar and Planetary Laboratory, The University of Arizona, 1629 E. University Blvd. Tucson, AZ 85721, USA



In conversation with...

Dr. Sophie Franklin, PSTT Cluster Director, talks with College Fellow and Cluster Advisor **Peter Sainsbury** about microscopes, exploration and having 'PHUNN' in the classroom.



- Winterbourne Earls Primary School, Salisbury
- Year 5/KS1 classroom teacher
- 30 years teaching in primary schools in a variety of roles including as Deputy Headteacher and Acting Headteacher
- Primary Science Teacher Award 2010
- Cluster Advisor for the PSTT

Peter Sainsbury has developed many collaborative groups including Deputy Headteacher networks and school science clusters. His science cluster work started initially for the East Salisbury Rural Cluster (ESRC) then extended to include all Salisbury area clusters who wished to join. The partnership of the school's senior management team, the science subject leader and the PSTT has also fed into the development of the National PSTT Cluster Programme. A keen advocate for the use of Microscopes in the classroom, Peter has worked closely with the Royal Microscopical Society on their primary Microscope Activity Kits (MAKs).

Why did you choose teaching?

I was off to Leeds to do Agricultural Botany but I had a last minute rethink and switched to doing a BEd four year Biological Sciences course at Winchester. Why? Although I was interested in agriculture and biology and wanted to do research into crop development, I just liked the idea of learning how children learn, and primary seemed to be where it was 'at' although other sectors are very important. Primary focuses on early development of children's learning and I wanted to understand that more.

How has your career changed over 30 years of teaching?

Initially I wanted to go straight up to being a Headteacher and I developed an early interest in school leadership. I didn't want to lose the element of teaching in the classroom so have actively looked for roles that contained substantial teaching elements as well as school leadership. I love the classroom environment and it's very important to me that I do not remove myself from that.

Where did the love of science come from?

Across primary and secondary school I can think of three teachers who made the science really interesting, but my love of science also came from my mother as she was a science teacher and also worked in special education. As a family we were outside in the world a lot, which focussed me on nature and biology. I was immersed in the world and found it to be such a wonderful place, in particular being by the sea and mountains. Science helped me explore my own habitat – I was always learning! My mother always engaged us in things. I remember walking up mountains with the family and she asked me the difference between



different types of mosses – it helped me know where the more substantial ground was, based on what moss grew there! I've always found a way to apply the science through exploring the world.

What are your favourite topics to teach in science?

I've got a natural curiosity and love of nature, but I prefer teaching physics and chemistry. I find it easier to get the children being practical and I like the hands-on element. Microscopy is also a favourite of mine – I grew up with microscopes. My mum saved up her pocket money and bought a telescope and a microscope which we were allowed to use. Within teaching I've used microscopes since I attended a PSTT conference and saw the Royal Microscopical Society's resources. Although it's not specifically in the curriculum and we don't need to teach it, microscopy is relevant to it in such a wide way and it adds to everything we do. Teaching is not about just teaching as you're told, but engaging and exploring further – microscopes allow you to do this. Solids, liquids and gases and materials are wonderfully practical and offer opportunities which are wide enough for children to have genuine exploration experiences. With all topics you've got to have some sort of over-arching control or it's anarchy. It's a balance of exploration and the structure of knowing where you (as the teacher) are going - playing with ideas but having purpose and rigour.

What are your drivers?

My fundamental approach to primary education is the 'Three Is': to **Inspire**, to have **Insight** and to have **Impact**. This approach seems to withstand all the different waves we have to battle. We always want to try to be inspirational in the classroom, but we need insight (educationally) and an understanding of what educational practice is about, but all this has to relate to the individual child. Lastly, we do have to account for ourselves and have an impact on the children.

I also have the word 'fun' crossed out on my classroom wall. We don't come to school to have 'FUN' – that's frivolous, unnecessary nonsense. But we do have **PHUNN** - Purposeful, Happy, Unfettered, Neurological Nutrition!

What are your influences?

It is my beliefs that drive me to want to find out about the world and who we are. But I am happy to be confused! I don't feel we need to understand everything and we won't either – that puts science in its place for me. The more we find out, the more complicated it gets. I don't see science and

religion as divergent or dichotomous - they complement each other. I don't always understand exactly how they are linked but it doesn't worry me. My Christian belief centres everything, which may be an untrendy thing to say, but for me it influences all I do.

Where do you find your ideas?

We have to be open to new thinking and not get too channelled. I think that's where primary works for me. There is a creativity about primary practice, where you tweak and apply things. Not all is original in primary science, but everything is new if you've never seen it before. Making old things new is very important. It's important to be excited about things that are new to you, even if they are not to other teachers or in other areas of the country.

What are the most common issues that your colleagues ask for support with?

The bit staff need support on is how to *do* the lesson rather than the actual content. I'm fortunate I have enough scientific knowledge that I can normally work things out. But those who do not can still get children doing science. Provided that children are exploring practically and not being told the wrong thing, they are being scientists already. I fear that teachers are often so scared of getting it wrong, there is a temptation to hand out a worksheet rather than allow the children to be hands-on. More support is needed to help teachers feel confident in teaching practical science.

What are your future plans for science inside/outside of your school?

I intend to keep exploring the classroom environment as it's such an important bit. We may lament some of the changes made at Local Authority level, but we have to stand on our own two feet a bit more and embrace the opportunities which change can bring. The weight of collaborative networks such as clusters supports this and allows us to have a wider perspective. Those groups must have a genuine centredness on the child. The exciting bit about creating a cluster and working within a network is finding what you believe in and finding people with similar aims and people who can expand on your own aims. If you have a collaborative network, you can lean on and support one other and expand your own horizons.



peter.sainsbury@pstt.org.uk



PSTT College Snapshot...

Meet six of our **College Fellows** who share some quick thoughts and suggestions for teaching primary science.

Jane Catto



Leamington Spa



Current year group:
Reception



Year of award: 2016

Most used piece of equipment in your science cupboard?

Magnets. They are always the most popular item on our investigation tables. Ask the children to make pieces of pipe cleaner move inside an empty lemonade bottle, or to use a paperclip to make a pattern in paint by moving a magnet around underneath the paper - the possibilities are endless.

Most recommended book/website for supporting teaching in science?

'[Science Talk](#)' a fantastic pack of 39 activity cards (one for each week of the school year) developed by The Ogden Trust. Each card contains a quick intro, a fun idea to investigate and helpful questions to ask to get children talking. It's perfect for EYFS but KS1 children have loved the ideas too. Walking on eggs without them breaking just has to be tried to be believed!

Neil McAllister



Ballyclare,
Northern Ireland



Current year group: P6



Year of award: 2013

Best strategy for helping children to identify and learn the names of a variety of plants?

We play a very simple team game. Teams stand back to back and each child has a number. Each team has a line of ten different leaves about ten steps in front of them. When I call out the name of a tree and a number, that child runs to the line of leaves, collects the leaf from the named tree and first back to me scores a point, and this is repeated with the rest of the leaves. Simple, but we can all identify every tree we see now by looking at the leaf!

Most used piece of equipment in your science cupboard?

Probably the magnifying glasses for my class. Almost every week we use them in our science so the children can observe everything more closely.



Tom Jones



- Newcastle-upon-Tyne
- Current year group: Y2
- Year of award: 2015

What is your favourite topic to teach in science?

This is tricky! Probably materials. There are lots of opportunities for developing investigative skills and the children can raise good questions of their own. It is a good topic to teach in a relevant real life context - currently in Year 2 we have linked materials to our Quayside topic..

Funniest thing you have heard a child say in a science lesson?

"You know when you're slaughtering a pig, Mr Jones..?"

Cath Milne



- Cromarty, Highlands of Scotland
- Current year group: P4/5
- Year of award: 2015

Best strategy for helping children to identify and learn the names of a variety of plants?

Taking them outside lots. We start off every outdoor learning session with, "Go and find me a...." and my class can now name the most common wildflowers we find here.

Funniest thing you have heard a child say in a science lesson?

"Neil strong arms was the first man on the moon."

Caroline Skerry



- Cornwall
- Current year group: Y4
- Year of award: 2012

Most used piece of equipment in your science cupboard?

Probably my hand lenses. I use them all the time as children often don't really properly look. The hand lenses really encourage them to observe and they get so excited when they see something that they've not noticed before.

Most recommended book/website for supporting teaching in science?

My children love [Explorify](#) – it has encouraged some excellent discussions and great ideas. Concept cartoons are another great way of getting the children thinking. I think with all resources you look at the ideas, cherry pick and make it work for you and your children.

Rebekah May



- Essex
- Current year group: Y6
- Year of award: 2015

Favourite topic to teach in science?

Evolution – I always did teach it, even before the curriculum change. I like the way the different strands of children's conceptual understanding and experience of the variety of life, adaptations and even their understanding of time converge to make this very big concept comprehensible.

Most used piece of equipment in your science cupboard?

Sorting/sample trays to hold, group and classify materials and objects. They can be really useful just to organise samples onto different tables. You don't need to buy special ones - we use paint palettes in our school.



Research Update

PSTT College Fellow
Clarysly Deller summarises
her MA research

'Raising the status of science in primary schools through Science Ambassadors'

PSTT College Fellow Clarysly Deller summarises her MA research which examined the role of Science Ambassadors in a primary school and how this could raise the importance and prominence of science while facilitating effective pupil voice.

Schools in England are under pressure to increase the prominence of science in school, and also to involve children more deeply in the learning process, giving them a voice in their learning. This has an impact on teaching and learning as children have more control over what is learned and how that learning occurs.

The research was an action research project involving Science Ambassadors appointed over a 3 year period in one primary school. It was set up as an initiative aimed at raising the profile of science in school and involving children more actively in their learning. It was started as an initiative stemming from a whole-school consultation activity which was part of the Primary Science Quality Mark, Gold Award process. Its aim was to improve science teaching and learning in the school.

A qualitative analysis was utilised to allow for scrutiny of the children's responses to the project using focus groups and semi-structured interviews. These were designed to elicit the children's perspectives on the initiative. The pupils reported renewed enthusiasm for science, better engagement and an ability to support their peers' learning. They discussed how they influenced the



Click here to find out more about Oxford Brookes University's work on Creativity in Primary Science.

learning in their classes and how they embraced a new role. They also felt the initiative raised the profile of science in school. These findings suggest that applying similar initiatives in other schools would raise the profile of their science as well as giving children a meaningful voice in their learning. They merit replication in other schools to test their generalisability.

Clarysly has been involved in primary education since 2003 after a career as a nurse and midwife. In her school roles as class teacher and science leader she developed and refined many science initiatives in schools, including involvement in a research project using drama techniques to teach science with Oxford-Brookes University and Staffordshire Entrust. She won a Primary Science Teacher Award in 2012 and took her school through the Primary Science Quality Mark, achieving a Gold Award, in 2015. She is currently employed as a Senior Lecturer in Primary Science Education at the Manchester Metropolitan University.

Interested in finding out more?
Please contact Clarysly by email:

 c.deller@mmu.ac.uk





Project Update

Family Learning in Science

A successful family learning programme gives adults and children positive experiences to learn together and to develop a culture of learning in the family. Science provides an ideal platform for this. Practical activities for families to do together can offer a learning environment that is informal and unthreatening, but also exciting and rewarding.

There are many good resources available to support family learning in science. Here we highlight three of these.

science4families



science4families offers primary teachers and families activity ideas for how to learn science together, in engaging, fun and inspirational way. Developed by teachers in Greater Manchester and involving two PSTT College Fellows, Louise Bousfield and Lianne Clegg, this website provides tried and tested ideas for shared experiences to enhance parent/carers engagement with their children's science learning and to develop Science capital across your whole school community.

The activities are grouped into three categories suggesting ways to support families at different levels of engagement.

Taking Root: where families join in with an activity

Growing Tall: where families are involved in the preparation or delivery

Reaching High: where families are involved in designing, planning and delivery

The home page offers an insight into Bradshaw Hall's Great Science Share for Schools which was a whole school family outdoor science fair. They definitely were reaching high with this event – an inspiration to all of us!

[CLICK FOR SCIENCE4FAMILIES](#)

If you are interested to find out more about linking your work with families to the Great Science Share for Schools visit: www.greatscienceshare.org If you have comments related to science4families tweet your views #science4families @UoMSEERIH or email us at fascinate@manchester.ac.uk

science4families was created as a result of a 2-year cluster project with Manchester and Stockport schools, facilitated by one of PSTT's Academic Collaborators, the Science and Engineering Education Research and Innovation Hub (SEERIH).

Learning Science Together



The 'Learning Science Together' resources include two different family science events: the **Kidnapping Mystery** (indoor activities) and **Nature Detectives** (outdoor activities) Children come to school with a parent/carers and are immersed in exciting problem solving and investigative activities. All the resources and instructions are **free to download** from the PSTT website.

[CLICK FOR LEARNING SCIENCE TOGETHER](#)

The British Science Association is actively promoting parental and family engagement in science. Their website offers multiple suggestions for activities to support family learning.

[CLICK FOR BSA WEBSITE](#)



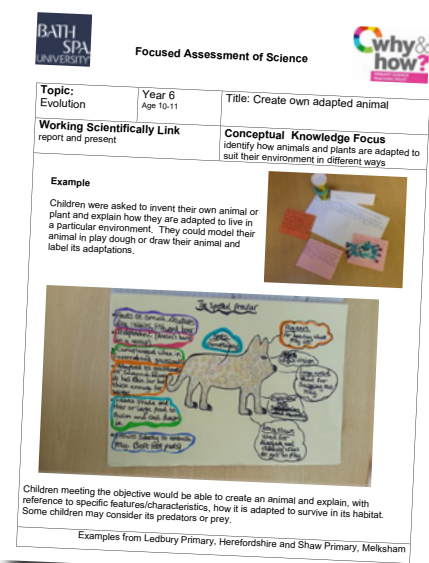
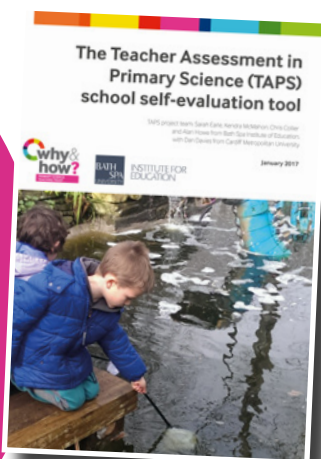
Project Update

New TAPS special issue of ASE's Primary Science

This open access special issue of ASE's Primary Science is designed to bring together a range of perspectives on the TAPS resources and how they are being used to support the teaching and assessment of primary science in different contexts. There are 10 articles written by 13 authors, including 6 teachers. For example, two articles by PSTT College Fellows Carol Sampey and Pauline Rodger explore how to develop a shared understanding of science and assessment, central to the TAPS pyramid self-evaluation tool. For those schools who find it difficult to begin a discussion about assessment in primary science, we have found that 'Focused Assessment' is a 'way in' and there are 4 articles in this special issue which discuss this approach to teaching Working Scientifically. The TAPS special issue articles can be downloaded at: <https://www.ase.org.uk/journals/primary-science/2018/03/2018/>

The Teacher Assessment in Primary Science (TAPS) project is funded by the Primary Science Teaching Trust (PSTT) and based at Bath Spa University (BSU). TAPS works collaboratively with teachers to develop resources to support teaching, learning and assessment in primary science. All resources are freely available on the PSTT website: <https://pstt.org.uk/resources/curriculum-materials/assessment>

New TAPS resources on the website include: focused assessment plans developed in Wales which link science and technology; a new pyramid pdf with examples of teaching and assessment from Wales.



Project Update

Wow Science



from



in association with



The Primary Science Teaching Trust (PSTT), in partnership with Learning Science, has recently introduced a new website for children, parents and teachers - Wow Science. Launched in March 2018, the project set out to identify the best resources for supporting science learning for primary school aged children, through games, videos, experiment/investigation ideas and other activities that they will find engaging. We further aimed to provide reassurance to parents that these materials would contain accurate scientific explanations where applicable and provide a safe environment for their children to explore. Ultimately, we would love for families to explore these materials together, with many of the resources providing activities that can be enjoyed by all ages. The site therefore provides links to excellent primary science learning materials either on the internet or in apps, helping children (and other family members) to enjoy science both inside and outside the classroom. Children may link from our site directly to web-based resources to play games or complete activities such as quizzes, watch videos or find out about experiments they can complete at home with or without parental support. Additionally, the site provides recommendations for apps on various platforms (iOS and Android).

The resources, which cover a broad range of science or STEM subjects and are suitable for all primary ages, can also be an excellent tool for teachers

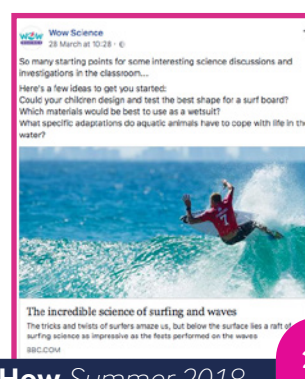
to use in their classrooms. Therefore, in addition to the activities presented on the main pages, Wow Science provides specific links to recommended sites for teachers to access many excellent resources. Some of these sites focus on activities to develop children's skills in working scientifically and all provide ideas and resources to promote effective teaching and learning in primary science, STEM and computing. Many of these sites have been produced by PSTT partners and collaborators.

All the resources on the site have been assessed by the PSTT for quality and suitability, ensuring the content we promote is accurate and useful to learning. We appreciate that teachers are often time-poor and need to be able to access relevant materials quickly. Over time, we intend to provide greater detail and improved search facilities on the teachers' page to enable you to pinpoint relevant content more efficiently. Learning Science Ltd continues to work with us in developing the website and increasing the content within it.

Alongside the website, we are providing additional support for teachers and parents in particular, through our dedicated Wow Science social media presence. On both Facebook and Twitter, in addition to promoting resources from our website, we seek out materials such as current news items, images and videos that provide excellent stimuli for discussion in the classroom or at home and suggest ways these could be used effectively.

Throughout the development of the Wow Science website, PSTT College Fellows, their colleagues, children and parents at their schools have provided feedback to enable us to ensure this resource meets our objectives. Since its launch, response has been incredibly positive and we have appreciated constructive suggestions for further development that will take place over the coming months.

Social media following is already approaching 1000 on Facebook and Twitter. If you haven't already visited the website or joined us on social media, you are missing out!





Key Dates

PSTT's international Primary Science Education Conference (PSEC)



6th - 8th
June
2019



Edinburgh
International
Conference Centre
(EICC)

Save the date and join us in Edinburgh for our international Primary Science Education Conference (PSEC)!

We are determined that there should be no barriers to every child receiving an outstanding education in primary science, and we are committed to our vision that teachers are the key to making this happen. Through crossing boundaries between the classroom and academia, between policy and practice, and between one nation and another, our conference in 2019 will empower educators to develop excellence in primary science.

Manchester University Great Science Share for Schools



19th
June
2018



University of
Manchester
#GreatSciShare

Save the date so that you can be part of this nationwide campaign to raise the profile and engagement in science and engineering. Last year 10,000 young people were involved in sharing their science learning with new audiences. Be part of making this year even greater!

The Great Science Share for Schools is a national campaign developed by The University of Manchester SEERIH team. It places children at the centre of celebrating their science learning in a non-competitive and inclusive environment. The central event is taking place on 19th June 2018 and this year's aim is to involve even more schools across the UK. But if you only have half an hour, or prefer to do something on a different day, you can still join in and be part of it - the main thing is to be involved. Why not link with other local schools, and ask STEM Ambassadors and STEM businesses/organisations to support you?

Primary Science Teacher Award Deadline



13th
July
2018



[Click Here to Nominate](#)

Do you know an outstanding primary science teacher?

These awards celebrate amazing primary science teaching across the UK, recognising talented teachers in early years, Key Stage 1 and Key Stage 2. Teachers who win this award are not only judged to be outstanding practitioners in their own classrooms, they also support and develop colleagues in their own schools and others either locally, regionally or nationally. Award-winning teachers are also innovative, creative, enthusiastic and will have significantly raised the profile of science in their own schools and beyond.

PSEC Call for Proposals Deadline



14th
September
2018



[Click here for more information](#)

ASE Futures Conference



5th - 6th
July
2018



University of
Hertfordshire



6 - 8 June 2019



Edinburgh International Conference Centre (EICC)

[REGISTER INTEREST](#)

[APPLY TO EXHIBIT OR SPONSOR](#)

THE PROGRAMME

PSEC will offer the very best professional development for teachers, school leaders, academics, and organisations involved in primary science.

Renowned physicist and science communicator JIM AL-KHALILI will be giving our opening keynote talk on 6th June 2019

Professor Al-Khalili has presented science inquiries on the tv and radio since 2004, and we are eagerly looking forward to hearing him speak at PSEC in 2019.



The rich programme will provide a daily combination of session including:

- Keynote talks
- Practical workshops
- Interactive talks
- Reflective practice seminars
- Science shows

The main daily themes for the conference are outlined below:

DAY 1 - THURSDAY

Engagement and enjoyment, working scientifically, assessment, outdoor learning, emotional well-being, SEND and EAL

DAY 2 - FRIDAY

The science of learning, play and early years, creativity, cross-curricular science, evidence-informed practice

DAY 3 - SATURDAY

Subject leadership, STEM, information technology, gender bias, science capital, transition

DELEGATE TICKETS

Tickets to PSEC 2019 are competitively priced in response to the tight budgets faced by many schools. Each pass is inclusive of lunch and refreshments.

10% Discount for all teachers attending from the same school, applicable to Teacher Rate tickets only.

Tickets now on sale! Click here for more information

PSEC Delegate Tickets	1 Day	2 Days	3 Days
Standard excl. VAT.	£150	£250	£300
Teacher* excl. VAT.	£110	£190	£240
Trainee Teacher incl. VAT (limited availability)	£50	£90	£120

NB PhD students are eligible for tickets at the Teacher Rate.

BURSARIES

We are very fortunate that several organisations have generously donated funding for bursaries to enable teachers to come to our Primary Science Education Conference 2019. Click here to find out more and to apply.

Connect with us:



/primaryscienceteachingtrust

Brought to you by:



In partnership with:



Why & How Summer 2018

27

RESOURCES
INSPIRED
BY YOU



ENGAGE • INSPIRE • LEARN

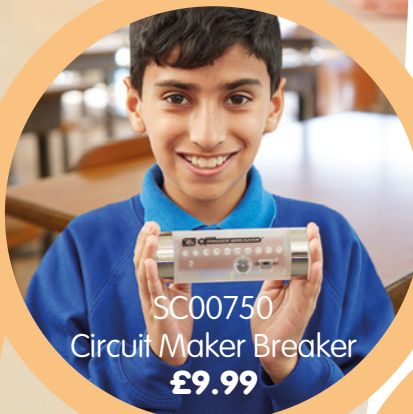
All your favourite
Science
resources
- in one place!



SC10072 - Can You Convince Me? **£32.95**



SC00945
Rechargeable
Stopwatches
£89.95



SC00750
Circuit Maker Breaker
£9.99



IT01121 Easi-Scope
£39.95



SC00117
Easi-Torch
£59.95



SC01155
Handheld
Microscopes 6pk
£49.95

www.tts-group.co.uk

*Terms and conditions: 1. This offer is valid online until 31.07.18 and applies to full priced Science items only. 2. Cannot be used in conjunction with any other offers and is subject to availability. 3. Excludes Apple products. 4. This offer can only be used once per customer. 5. Offer code must be quoted at online checkout. 6. TTS Group Limited reserve the right to change these terms & conditions on reasonable notice. 7. Offer is only open to customers based in the UK (inc. Channel Islands and Isle of Man). 8. Discounts are applied to the ex-VAT sub-total amount.